# FCC Test Report

| | | |
|---|---|---|
| **FCC ID** | : | **SQGBT900US** |
| **Equipment** | : | **Intelligent BT4.0 Dual Mode USB Dongle** |
| **Model No.** | : | **BT900-US** |
| **Brand Name** | : | **Laird Technologies** |
| **Applicant** | : | **Laird Technologies** |
| **Address** | : | **11160 Thompson Ave., Lenexa, Kansas 66219, USA** |
| **Standard** | : | **47 CFR FCC Part 15.247** |
| **Received Date** | : | **Dec. 10, 2014** |
| **Tested Date** | : | **Dec. 11 ~ Dec. 15, 2014** |

**We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.**

**Approved & Reviewed by:**

**Gary Chang / Manager**

Testing Laboratory
2732

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# Release Record

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR442807-01AE | Rev. 01 | Initial issue | Jan. 07, 2015 |

# Summary of Test Results

| FCC Rules | Test Items | Measured | Result |
|---|---|---|---|
| 15.207 | AC Power Line Conducted Emissions | [dBuV]: 4.926MHz<br>35.33 (Margin -10.67dB) - AV | Pass |
| 15.247(d)<br>15.209 | Radiated Emissions | [dBuV/m at 3m]: 7320.00MHz<br>50.22 (Margin -3.78dB) - AV | Pass |
| 15.247(b)(3) | Maximum Output Power | Power [dBm]: 8.17 | Pass |
| 15.247(a)(2) | 6dB Bandwidth | Meet the requirement of limit | Pass |
| 15.247(e) | Power Spectral Density | Meet the requirement of limit | Pass |
| 15.203 | Antenna Requirement | Meet the requirement of limit | Pass |

# 1 General Description

## 1.1 Information

### 1.1.1 Specification of the Equipment under Test (EUT)

| RF General Information | | | | |
|---|---|---|---|---|
| **Frequency Range (MHz)** | **Bluetooth Mode** | **Ch. Freq. (MHz)** | **Channel Number** | **Data Rate** |
| 2400-2483.5 | V4.0 LE | 2402-2480 | 0-39 [40] | 1 Mbps |
| Note 1: Bluetooth LE (Low energy) uses GFSK modulation. | | | | |

### 1.1.2 Antenna Details

| Ant. No. | Type | Gain (dBi) | Connector | Remark |
|---|---|---|---|---|
| 1 | Chip | 0.5 | --- | --- |

### 1.1.3 Power Supply Type of Equipment under Test (EUT)

| | |
|---|---|
| **Power Supply Type** | 5Vdc from host |

### 1.1.4 Accessories

N/A

### 1.1.5 Channel List

| Frequency band (MHz) | | | | 2400~2483.5 | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 37 | 2402 | 9 | 2422 | 18 | 2442 | 28 | 2462 |
| 0 | 2404 | 10 | 2424 | 19 | 2444 | 29 | 2464 |
| 1 | 2406 | 38 | 2426 | 20 | 2446 | 30 | 2466 |
| 2 | 2408 | 11 | 2428 | 21 | 2448 | 31 | 2468 |
| 3 | 2410 | 12 | 2430 | 22 | 2450 | 32 | 2470 |
| 4 | 2412 | 13 | 2432 | 23 | 2452 | 33 | 2472 |
| 5 | 2414 | 14 | 2434 | 24 | 2454 | 34 | 2474 |
| 6 | 2416 | 15 | 2436 | 25 | 2456 | 35 | 2476 |
| 7 | 2418 | 16 | 2438 | 26 | 2458 | 36 | 2478 |
| 8 | 2420 | 17 | 2440 | 27 | 2460 | 39 | 2480 |

### 1.1.6 Test Tool and Duty Cycle

| | |
|---|---|
| **Test tool** | Blue Test3, Version: 2.5.8.667 |
| **Duty cycle of test signal (%)** | 66.97% |
| **Duty Factor (dB)** | 1.74 |

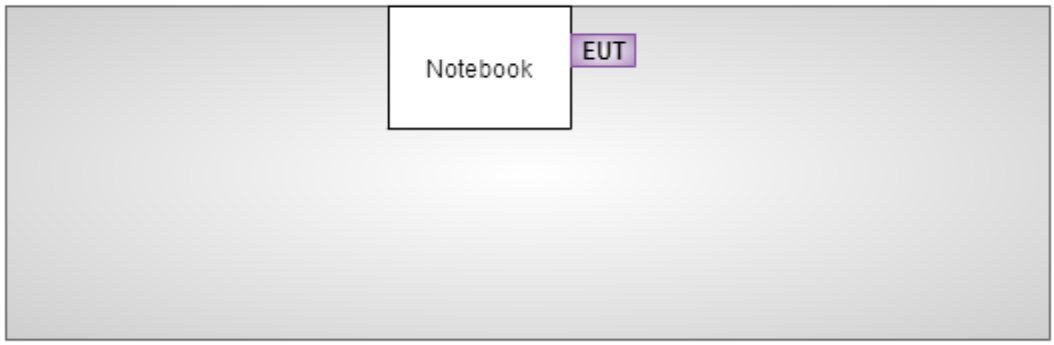
### 1.1.7 Power Setting

| Modulation Mode | Test Frequency (MHz) | | |
|---|---|---|---|
| | 2402 | 2440 | 2480 |
| GFSK/1Mbps | Default | Default | Default |

## 1.2 Local Support Equipment List

| Support Equipment List | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **S/N** | **Signal cable / Length (m)** |
| 1 | Notebook | DELL | Latitude E5420 | B6FV9T1 | --- |

## 1.3 Test Setup Chart

| Test Setup Diagram |
|---|
|  |

## 1.4 Test Equipment List and Calibration Data

| Test Item | Conducted Emission | | | | |
|---|---|---|---|---|---|
| **Test Site** | Conduction room 1 / (CO01-WS) | | | | |
| **Instrument** | **Manufacturer** | **Model No.** | **Serial No.** | **Calibration Date** | **Calibration Until** |
| EMC Receiver | R&S | ESCS 30 | 100169 | Oct. 17, 2014 | Oct. 16, 2015 |
| LISN | SCHWARZBECK | Schwarzbeck 8127 | 8127-667 | Nov. 17, 2014 | Nov. 16, 2015 |
| LISN (Support Unit) | SCHWARZBECK | Schwarzbeck 8127 | 8127-666 | Nov. 26, 2014 | Nov. 25, 2015 |
| RF Cable-CON | Woken | CFD200-NL | CFD200-NL-001 | Apr. 23, 2014 | Apr. 22, 2015 |
| 50 ohm terminal (Support Unit) | NA | 50 | 04 | Apr. 18, 2014 | Apr. 17, 2015 |
| Measurement Software | AUDIX | e3 | 6.120210k | NA | NA |
| Note: Calibration Interval of instruments listed above is one year. | | | | | |

| Test Item | Radiated Emission | | | | |
|---|---|---|---|---|---|
| **Test Site** | 966 chamber 3 / (03CH03-WS) | | | | |
| **Instrument** | **Manufacturer** | **Model No.** | **Serial No.** | **Calibration Date** | **Calibration Until** |
| Spectrum Analyzer | Agilent | N9010A | MY53400091 | Sep. 16, 2014 | Sep. 15, 2015 |
| Receiver | Agilent | N9038A | MY53290044 | Oct. 21, 2014 | Oct. 20, 2015 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-562 | Feb. 07, 2014 | Feb. 06, 2015 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1206 | Feb. 20, 2014 | Feb. 19, 2015 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170517 | Nov. 10, 2014 | Nov. 09, 2015 |
| Preamplifier | EMC | EMC02325 | 980187 | Sep. 26, 2014 | Sep. 25, 2015 |
| Preamplifier | Agilent | 83017A | MY53270014 | Sep. 17, 2014 | Sep. 16, 2015 |
| Preamplifier | EMC | EMC184045B | 980192 | Aug. 26, 2014 | Aug. 25, 2015 |
| RF cable-3M | HUBER+SUHNER | SUCOFLEX104 | MY22620/4 | Feb. 19, 2014 | Feb. 18, 2015 |
| RF cable-8M | HUBER+SUHNER | SUCOFLEX104 | MY22601/4 | Feb. 19, 2014 | Feb. 18, 2015 |
| RF cable-1M | HUBER+SUHNER | SUCOFLEX104 | MY22624/4 | Feb. 19, 2014 | Feb. 18, 2015 |
| LF cable-0.8M | EMC | EMC8D-NM-NM-800 | EMC8D-NM-NM-800-001 | Feb. 17, 2014 | Feb. 16, 2015 |
| LF cable-3M | EMC | EMC8D-NM-NM-3000 | 131103 | Feb. 17, 2014 | Feb. 16, 2015 |
| LF cable-13M | EMC | EMC8D-NM-NM-13000 | 131104 | Feb. 17, 2014 | Feb. 16, 2015 |
| Loop Antenna | R&S | HFH2-Z2 | 100330 | Nov. 10, 2014 | Nov. 09, 2015 |
| Measurement Software | AUDIX | e3 | 6.120210g | NA | NA |
| Note: Calibration Interval of instruments listed above is one year. | | | | | |

| Test Item | RF Conducted | | | | |
|---|---|---|---|---|---|
| Test Site | (TH01-WS) | | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSV40 | 101063 | Feb. 17, 2014 | Feb. 16, 2015 |
| Power Meter | Anritsu | ML2495A | 1241002 | Sep. 29, 2014 | Sep. 28, 2015 |
| Power Sensor | Anritsu | MA2411B | 1207366 | Sep. 29, 2014 | Sep. 28, 2015 |
| Measurement Software | Sporton | Sporton_1 | 1.3.30 | NA | NA |
| Note: Calibration Interval of instruments listed above is one year. | | | | | |

## 1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
ANSI C63.10-2013
FCC KDB 558074 D01 DTS Meas Guidance v03r02

## 1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

| Measurement Uncertainty | |
|---|---|
| Parameters | Uncertainty |
| Bandwidth | ±34.134 Hz |
| Conducted power | ±0.808 dB |
| Frequency error | ±34.134 Hz |
| Temperature | ±0.6 $^{o}$C |
| Conducted emission | ±2.670 dB |
| AC conducted emission | ±2.92 dB |
| Radiated emission ≤ 1GHz | ±3.26 dB |
| Radiated emission > 1GHz | ±4.94 dB |

# 2 Test Configuration

## 2.1 Testing Condition

| Test Item | Test Site | Ambient Condition | Tested By |
|---|---|---|---|
| AC Conduction | CO01-WS | 19°C / 67% | Peter Lin |
| Radiated Emissions | 03CH03-WS | 21°C / 63% | Lance Xiao |
| RF Conducted | TH01-WS | 23°C / 62% | Brad Wu |

- FCC site registration No.: 390588
- IC site registration No.: 10807C-1

## 2.2 The Worst Test Modes and Channel Details

| Test item | Mode | Test Frequency (MHz) | Data Rate (Mbps) | Test Configuration |
|---|---|---|---|---|
| AC Power Line Conducted Emissions | GFSK | 2480 | 1Mbps | --- |
| Radiated Emissions ≤ 1GHz | GFSK | 2480 | 1Mbps | --- |
| Radiated Emissions > 1GHz | GFSK | 2402, 2440, 2480 | 1Mbps | --- |
| Maximum Output Power | GFSK | 2402, 2440, 2480 | 1Mbps | --- |
| 6dB bandwidth | | | | |
| Power spectral density | | | | |

# 3 Transmitter Test Results

## 3.1 Conducted Emissions

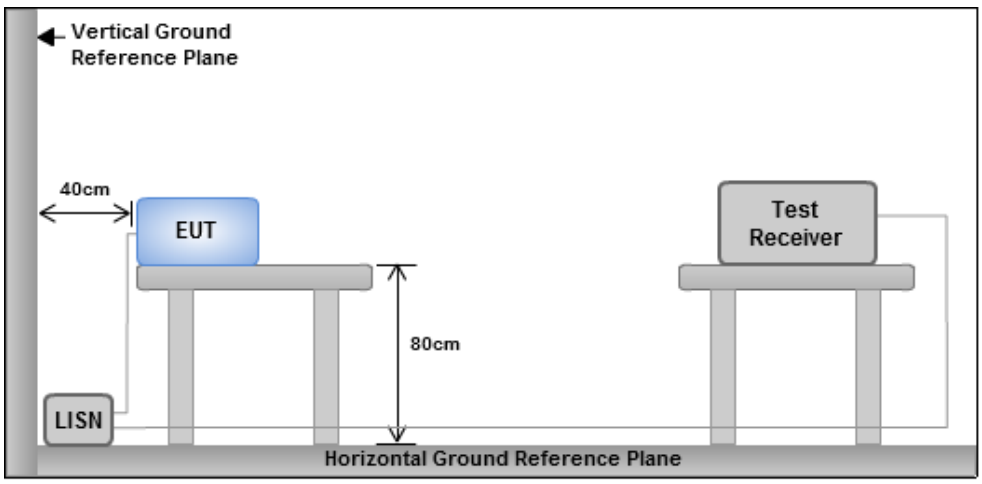
### 3.1.1 Limit of Conducted Emissions

| Conducted Emissions Limit | | |
|---|---|---|
| **Frequency Emission (MHz)** | **Quasi-Peak** | **Average** |
| 0.15-0.5 | 66 - 56 * | 56 - 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| Note 1: * Decreases with the logarithm of the frequency. | | |

### 3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V/60Hz

### 3.1.3 Test Setup

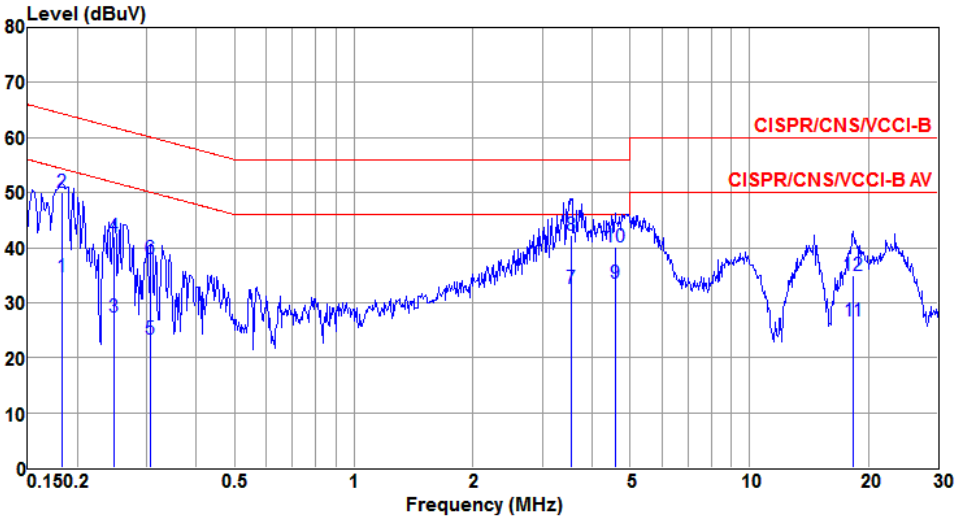



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

### 3.1.4 Test Result of Conducted Emissions

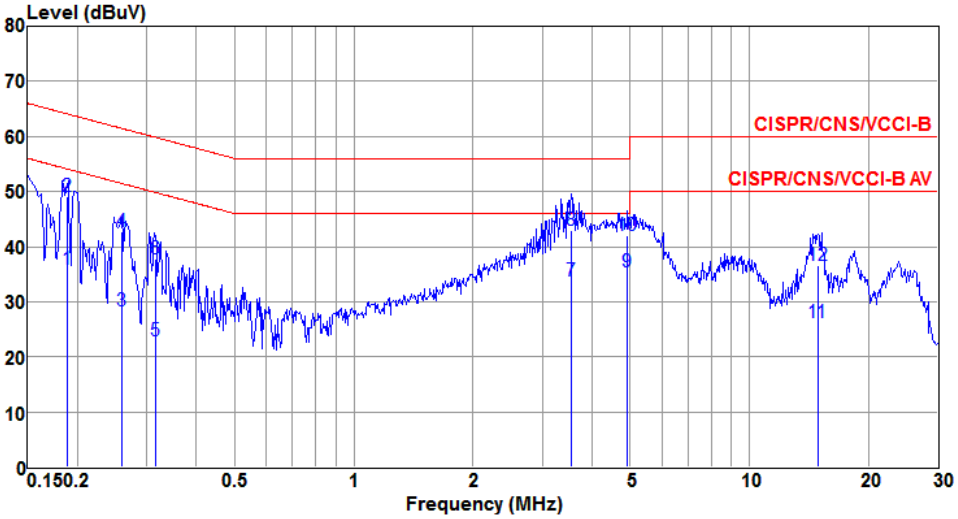
| Modulation Mode | GFSK | Test Freq. (MHz) | 2480 |
|---|---|---|---|
| Power Phase | Line | Test Configuration | 1 |




| | Freq | Level | Limit Line | Over Limit | Read Level | LISN factor | cable loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | dBuV | dB | dB | |
| 1 | 0.182 | 34.65 | 54.37 | -19.72 | 34.57 | 0.07 | 0.01 | Average |
| 2 | 0.182 | 50.02 | 64.37 | -14.35 | 49.94 | 0.07 | 0.01 | QP |
| 3 | 0.248 | 27.27 | 51.82 | -24.55 | 27.19 | 0.07 | 0.01 | Average |
| 4 | 0.248 | 42.10 | 61.82 | -19.72 | 42.02 | 0.07 | 0.01 | QP |
| 5 | 0.307 | 23.45 | 50.05 | -26.60 | 23.36 | 0.07 | 0.02 | Average |
| 6 | 0.307 | 38.11 | 60.05 | -21.94 | 38.02 | 0.07 | 0.02 | QP |
| 7 | 3.547 | 32.60 | 46.00 | -13.40 | 32.35 | 0.12 | 0.13 | Average |
| 8 | 3.547 | 42.22 | 56.00 | -13.78 | 41.97 | 0.12 | 0.13 | QP |
| 9* | 4.574 | 33.57 | 46.00 | -12.43 | 33.28 | 0.13 | 0.16 | Average |
| 10 | 4.574 | 40.02 | 56.00 | -15.98 | 39.73 | 0.13 | 0.16 | QP |
| 11 | 18.328 | 26.66 | 50.00 | -23.34 | 25.98 | 0.31 | 0.37 | Average |
| 12 | 18.328 | 34.83 | 60.00 | -25.17 | 34.15 | 0.31 | 0.37 | QP |

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

| Modulation Mode | GFSK | Test Freq. (MHz) | 2480 |
|---|---|---|---|
| Power Phase | Neutral | Test Configuration | 1 |




| | Freq | Level | Limit Line | Over Limit | Read Level | LISN factor | cable loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | dBuV | dB | dB | |
| 1 | 0.188 | 35.93 | 54.12 | -18.19 | 35.85 | 0.07 | 0.01 | Average |
| 2 | 0.188 | 49.21 | 64.12 | -14.91 | 49.13 | 0.07 | 0.01 | QP |
| 3 | 0.259 | 28.27 | 51.47 | -23.20 | 28.19 | 0.07 | 0.01 | Average |
| 4 | 0.259 | 42.66 | 61.47 | -18.81 | 42.58 | 0.07 | 0.01 | QP |
| 5 | 0.315 | 23.01 | 49.84 | -26.83 | 22.92 | 0.07 | 0.02 | Average |
| 6 | 0.315 | 37.81 | 59.84 | -22.03 | 37.72 | 0.07 | 0.02 | QP |
| 7 | 3.547 | 33.74 | 46.00 | -12.26 | 33.49 | 0.12 | 0.13 | Average |
| 8 | 3.547 | 42.98 | 56.00 | -13.02 | 42.73 | 0.12 | 0.13 | QP |
| 9* | 4.926 | 35.33 | 46.00 | -10.67 | 35.01 | 0.15 | 0.17 | Average |
| 10 | 4.926 | 42.00 | 56.00 | -14.00 | 41.68 | 0.15 | 0.17 | QP |
| 11 | 14.907 | 26.28 | 50.00 | -23.72 | 25.68 | 0.29 | 0.31 | Average |
| 12 | 14.907 | 36.52 | 60.00 | -23.48 | 35.92 | 0.29 | 0.31 | QP |

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

## 3.2 6dB and Occupied Bandwidth

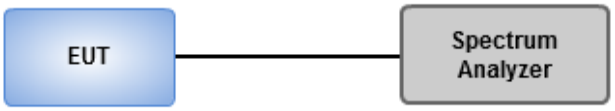
### 3.2.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

### 3.2.2 Test Procedures

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.
5. Use OBW measurement function of spectrum analyzer to measure occupied bandwidth.

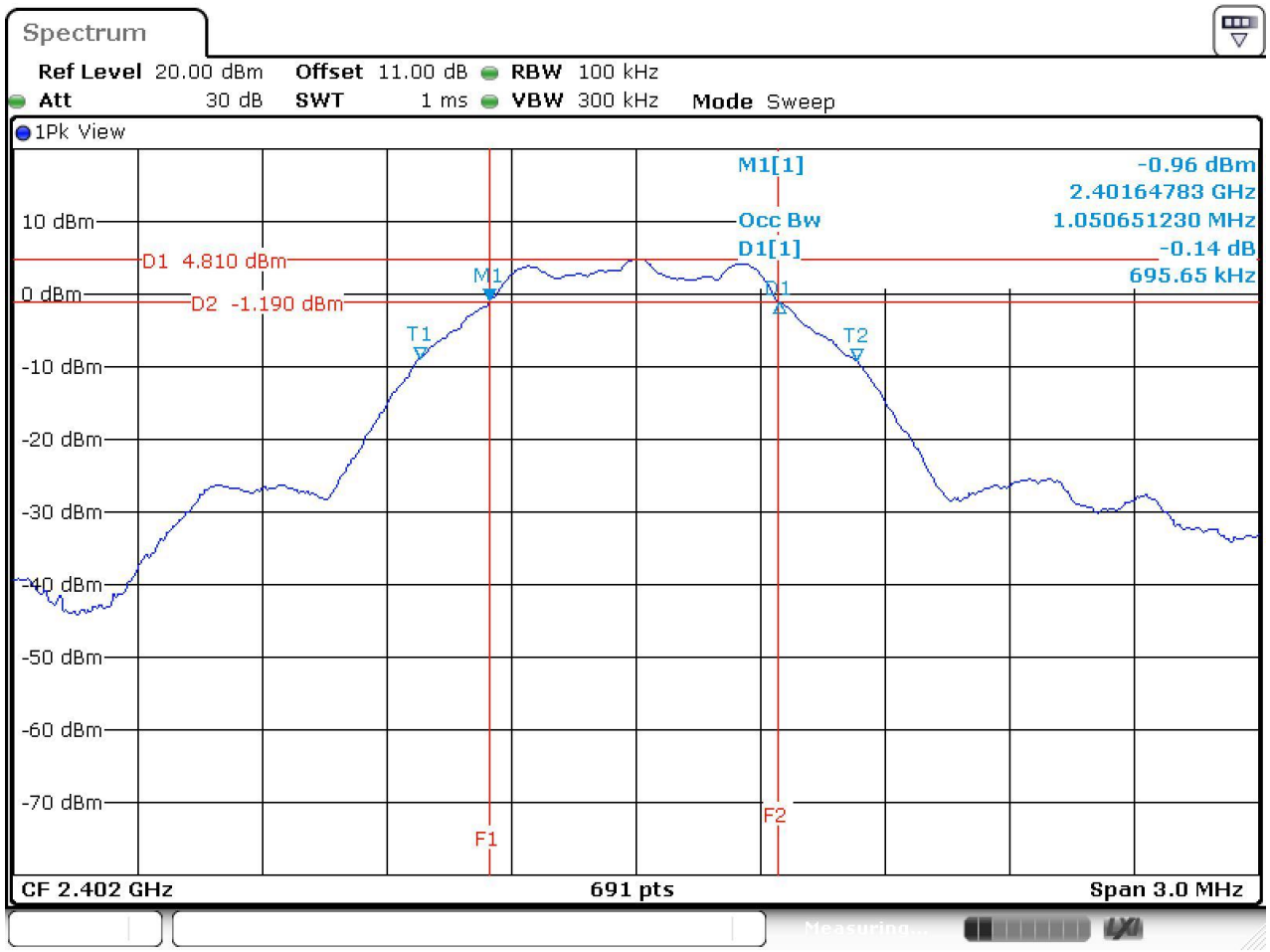
### 3.2.3 Test Setup



### 3.2.4 Test Result of 6dB and Occupied Bandwidth

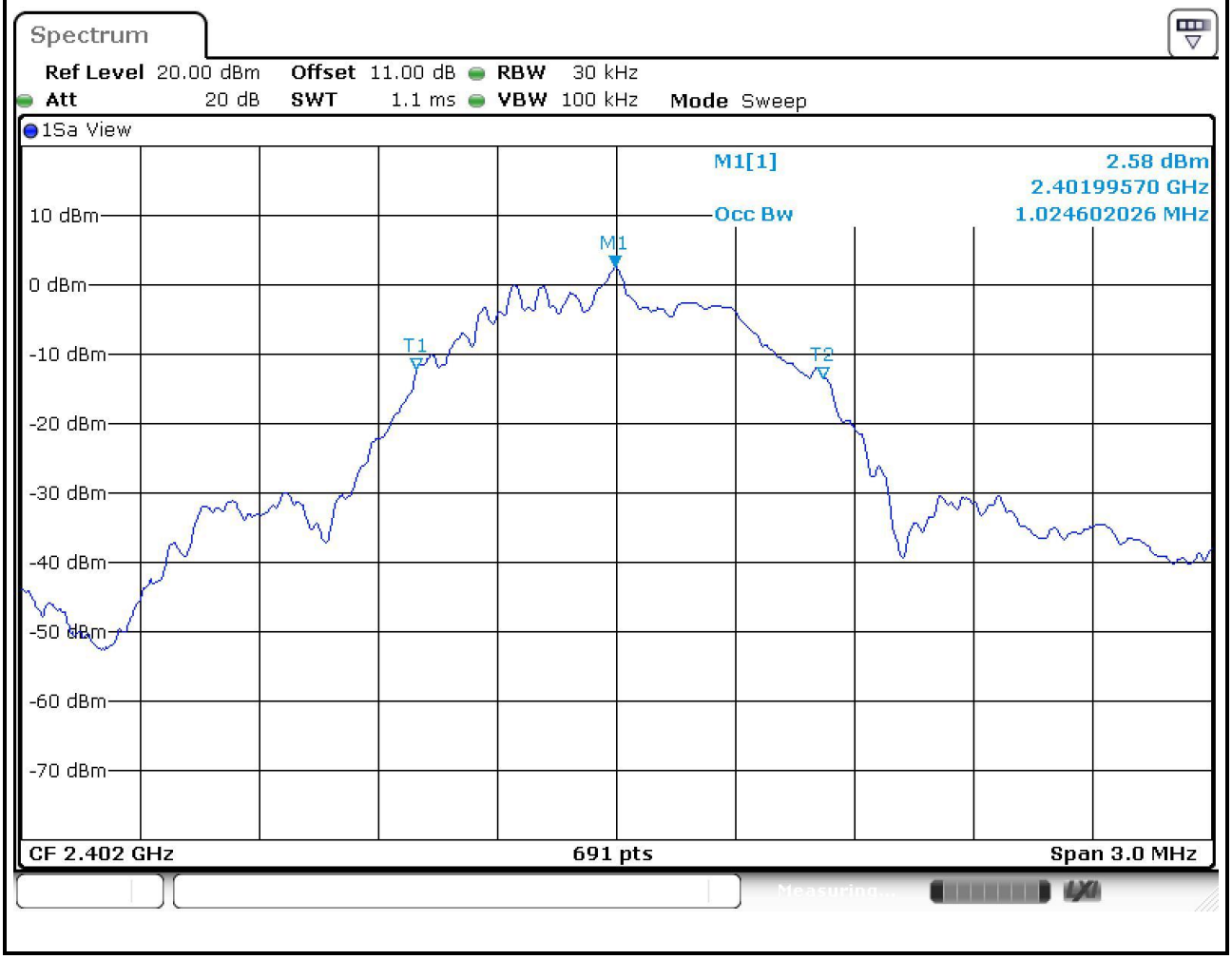
| Freq. (MHz) | 6dB Bandwidth (kHz) | Limit (kHz) |
|---|---|---|
| **2402** | 696 | 500 |
| **2440** | 696 | 500 |
| **2480** | 696 | 500 |

**Worst Plots**



| Freq. (MHz) | 99% Occupied Bandwidth (MHz) |
|---|---|
| **2402** | 1.02 |
| **2440** | 1.02 |
| **2480** | 1.02 |

**Worst Plots**



# 3.3 RF Output Power

## 3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

☒ Antenna gain <= 6dBi, no any corresponding reduction is in output power limit.

☐ Antenna gain > 6dBi

☐ Non Fixed, point to point operations.
The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

☐ Fixed, point to point operations
Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations ,no any corresponding reduction is in transmitter peak output power

## 3.3.2 Test Procedures

☒ Maximum Peak Conducted Output Power

☐ **Spectrum analyzer**

1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.

☒ **Power meter**

1. A broadband Peak RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

☒ Maximum Conducted Average Output Power ( For reference only)

☒ **Power meter**

1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

## 3.3.3 Test Setup

### 3.3.4 Test Result of Maximum Output Power

| Freq. (MHz) | Peak Conducted Power (dBm) | Limit (dBm) |
|---|---|---|
| 2402 | 5.84 | 30 |
| 2440 | 7.14 | 30 |
| 2480 | **8.17** | 30 |

| Freq. (MHz) | Average Conducted Power (dBm) | Limit (dBm) |
|---|---|---|
| 2402 | 5.28 | 30 |
| 2440 | 6.68 | 30 |
| 2480 | 7.89 | 30 |

Note: Average power is for reference only.

## 3.4 Power Spectral Density

### 3.4.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

### 3.4.2 Test Procedures

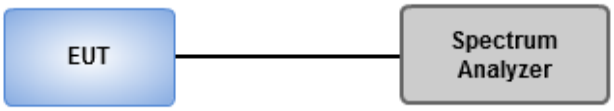
☒ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.

1. Set the RBW = 3kHz, VBW = 10kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

☐ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.

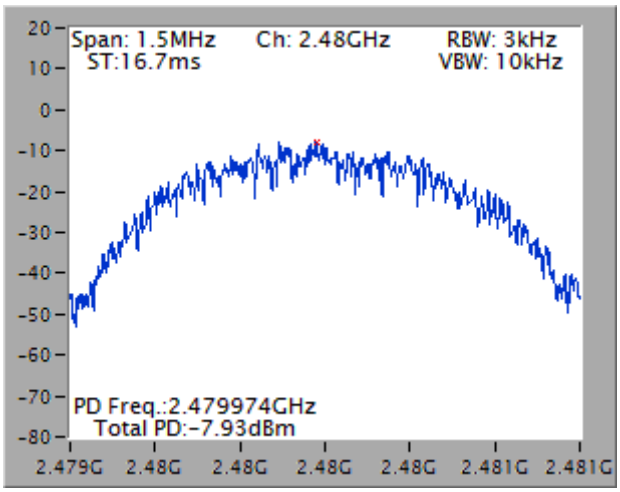
1. Set the RBW = 100kHz, VBW = 300 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Set the sweep time to: ≥ 10 x (number of measurement points in sweep) x (maximum data rate per stream).
4. Perform the measurement over a single sweep.
5. Use the peak marker function to determine the maximum amplitude level.\

### 3.4.3 Test Setup



### 3.4.4 Test Result of Power Spectral Density

| Freq. (MHz) | Power Spectral Density (dBm / 3kHz) | Limit (dBm) |
|---|---|---|
| 2402 | -10.67 | 8 |
| 2440 | -9.17 | 8 |
| 2480 | -7.93 | 8 |

| Worst Plots |
|---|
|  |

# 3.5 Emissions in Restricted Frequency Bands

## 3.5.1 Limit of Emissions in Restricted Frequency Bands

| Restricted Band Emissions Limit | | | |
|---|---|---|---|
| **Frequency Range (MHz)** | **Field Strength (uV/m)** | **Field Strength (dBuV/m)** | **Measure Distance (m)** |
| 0.009~0.490 | 2400/F(kHz) | 48.5 - 13.8 | 300 |
| 0.490~1.705 | 24000/F(kHz) | 33.8 - 23 | 30 |
| 1.705~30.0 | 30 | 29 | 30 |
| 30~88 | 100 | 40 | 3 |
| 88~216 | 150 | 43.5 | 3 |
| 216~960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

**Note 1:**
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
**Note 2:**
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

## 3.5.2 Test Procedures

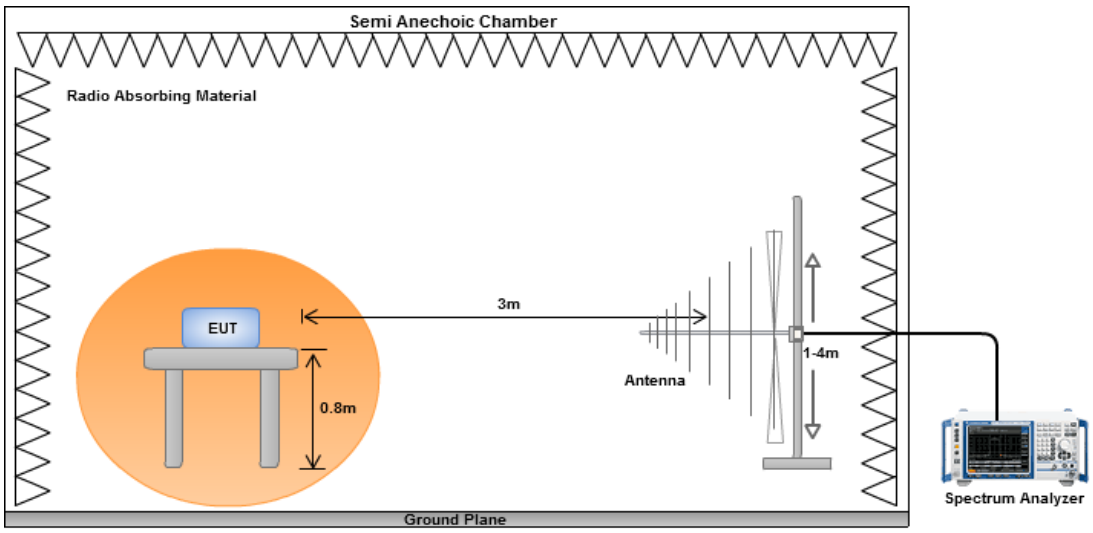
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

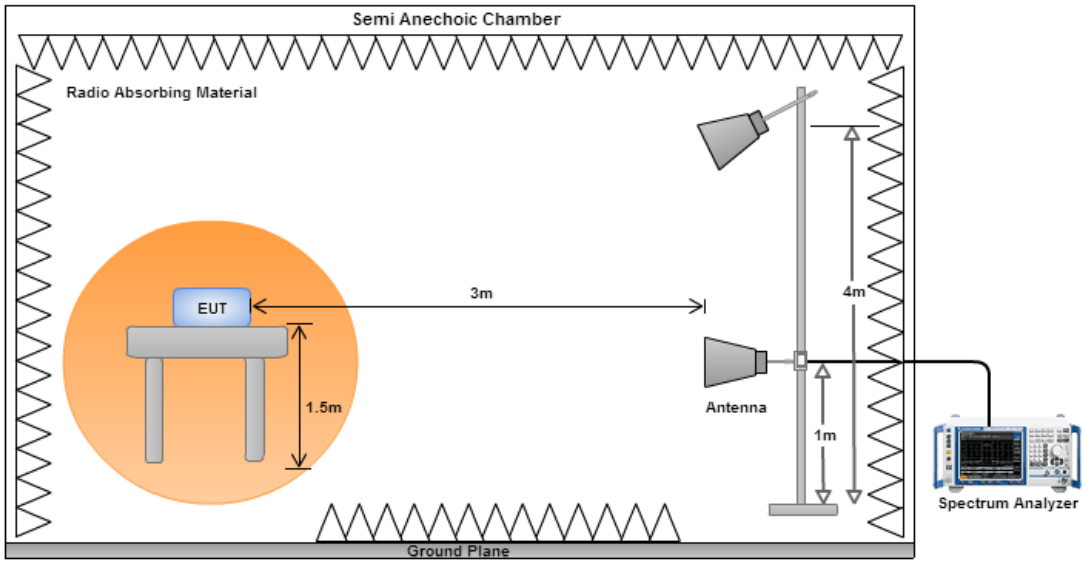
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

### 3.5.3 Test Setup

**Radiated Emissions below 1 GHz**

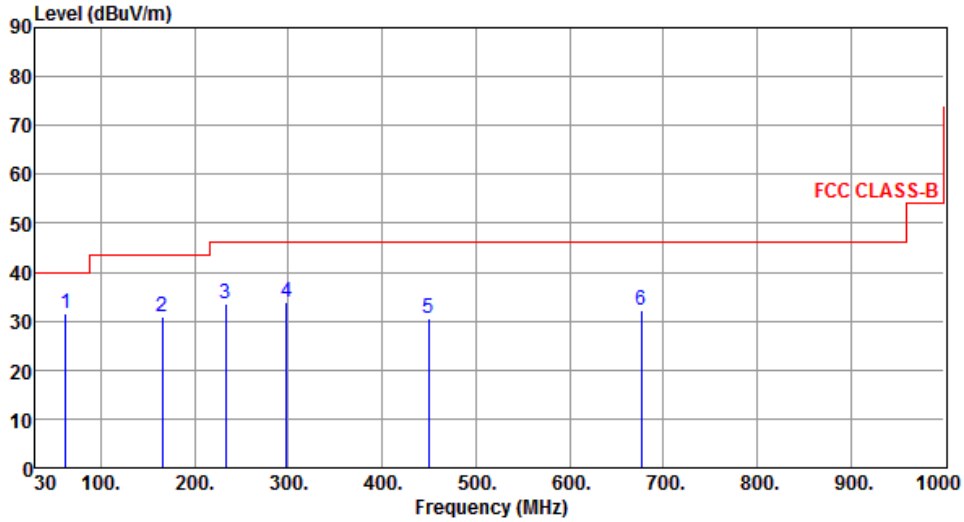



**Radiated Emissions above 1 GHz**



### 3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

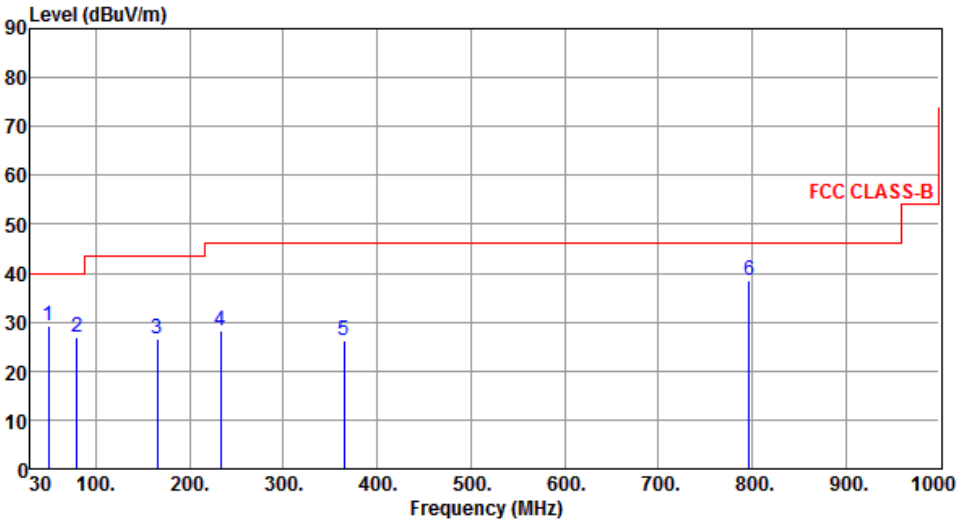
| Modulation | GFSK | Test Freq. (MHz) | 2480 |
|---|---|---|---|
| Polarization | Horizontal | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 62.01 | 31.56 | 40.00 | -8.44 | 45.47 | -13.91 | Peak | --- | --- |
| 2 | 165.80 | 30.76 | 43.50 | -12.74 | 44.47 | -13.71 | Peak | --- | --- |
| 3 | 232.73 | 33.41 | 46.00 | -12.59 | 48.58 | -15.17 | Peak | --- | --- |
| 4 | 297.72 | 33.76 | 46.00 | -12.24 | 46.44 | -12.68 | Peak | --- | --- |
| 5 | 450.01 | 30.57 | 46.00 | -15.43 | 39.17 | -8.60 | Peak | --- | --- |
| 6 | 676.99 | 32.38 | 46.00 | -13.62 | 36.90 | -4.52 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

| Modulation | GFSK | Test Freq. (MHz) | 2480 |
|---|---|---|---|
| Polarization | Vertical | | |

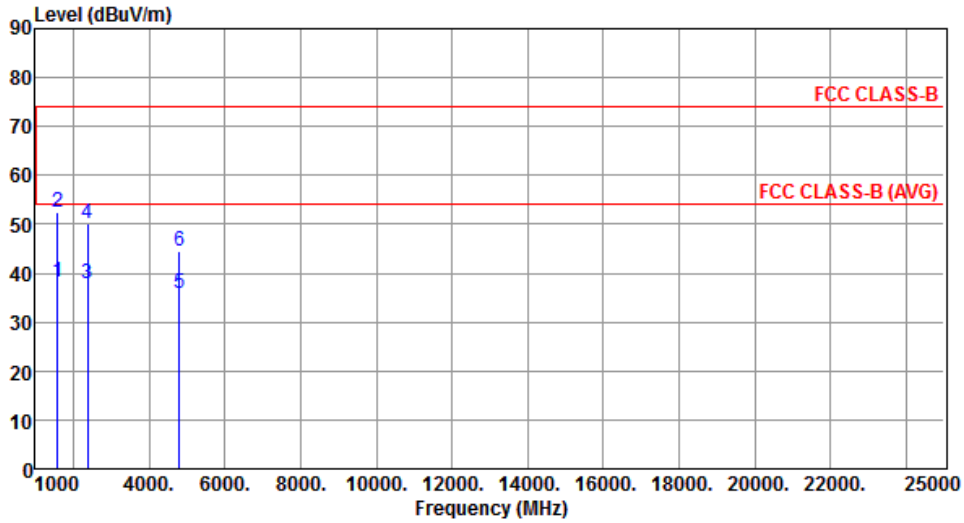



| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 49.40 | 29.23 | 40.00 | -10.77 | 42.22 | -12.99 | Peak | --- | --- |
| 2 | 79.47 | 26.93 | 40.00 | -13.07 | 44.50 | -17.57 | Peak | --- | --- |
| 3 | 165.80 | 26.58 | 43.50 | -16.92 | 40.29 | -13.71 | Peak | --- | --- |
| 4 | 232.73 | 28.34 | 46.00 | -17.66 | 43.51 | -15.17 | Peak | --- | --- |
| 5 | 364.65 | 26.30 | 46.00 | -19.70 | 37.30 | -11.00 | Peak | --- | --- |
| 6 | 797.27 | 38.57 | 46.00 | -7.43 | 41.01 | -2.44 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

## 3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for GFSK

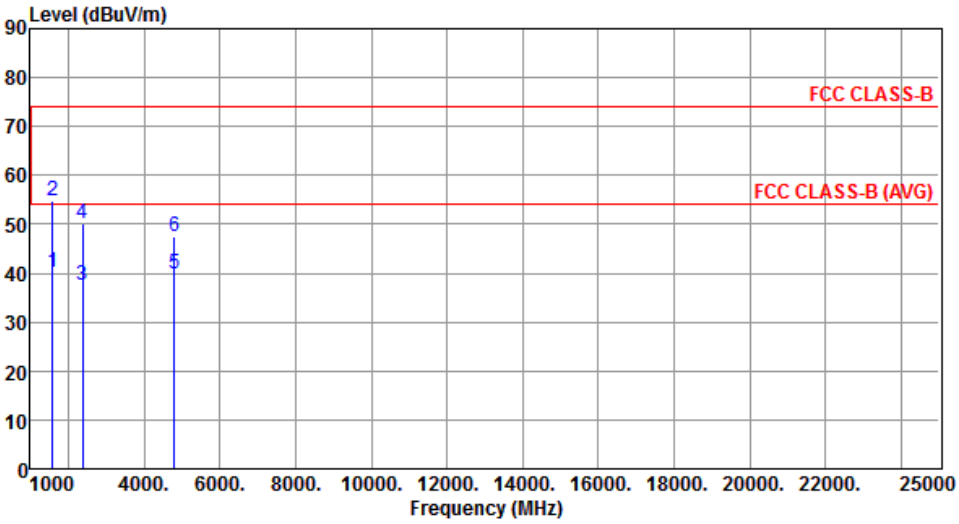
| Modulation | GFSK | Test Freq. (MHz) | 2402 |
|---|---|---|---|
| Polarization | Horizontal | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1595.00 | 38.04 | 54.00 | -15.96 | 42.70 | -4.66 | Average | --- | --- |
| 2 | 1595.00 | 52.34 | 74.00 | -21.66 | 57.00 | -4.66 | Peak | --- | --- |
| 3 | 2390.00 | 37.88 | 54.00 | -16.12 | 39.56 | -1.68 | Average | --- | --- |
| 4 | 2390.00 | 50.14 | 74.00 | -23.86 | 51.82 | -1.68 | Peak | --- | --- |
| 5 | 4804.00 | 35.87 | 54.00 | -18.13 | 30.53 | 5.34 | Average | --- | --- |
| 6 | 4804.00 | 44.52 | 74.00 | -29.48 | 39.18 | 5.34 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

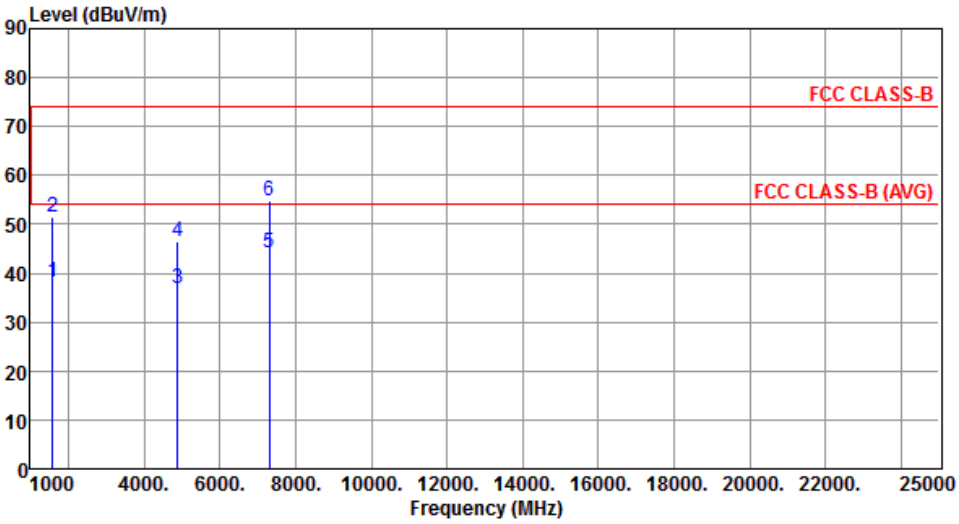
| Modulation | GFSK | Test Freq. (MHz) | 2402 |
|---|---|---|---|
| Polarization | Vertical | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1595.00 | 40.08 | 54.00 | -13.92 | 44.74 | -4.66 | Average | --- | --- |
| 2 | 1595.00 | 54.65 | 74.00 | -19.35 | 59.31 | -4.66 | Peak | --- | --- |
| 3 | 2390.00 | 37.63 | 54.00 | -16.37 | 39.31 | -1.68 | Average | --- | --- |
| 4 | 2390.00 | 50.08 | 74.00 | -23.92 | 51.76 | -1.68 | Peak | --- | --- |
| 5 | 4804.00 | 39.90 | 54.00 | -14.10 | 34.56 | 5.34 | Average | --- | --- |
| 6 | 4804.00 | 47.47 | 74.00 | -26.53 | 42.13 | 5.34 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

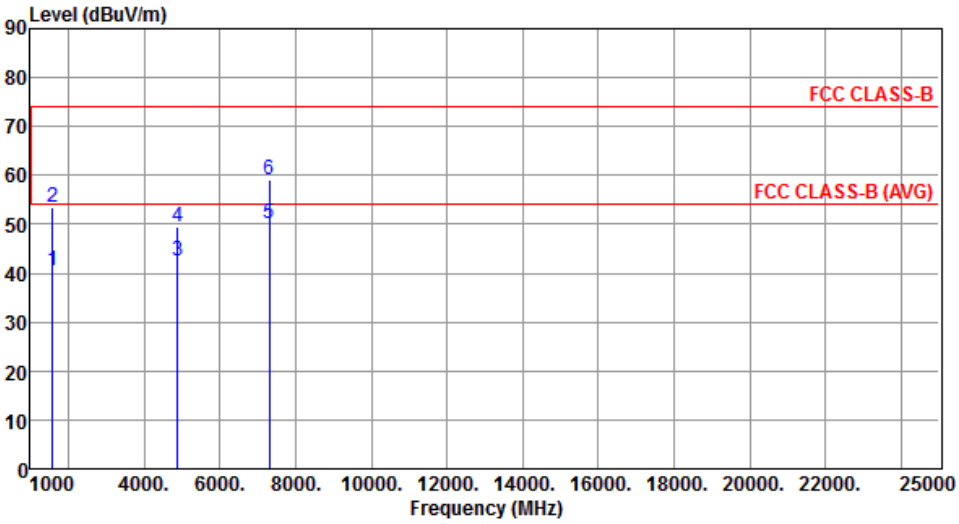
| | | | |
|---|---|---|---|
| **Modulation** | GFSK | **Test Freq. (MHz)** | 2440 |
| **Polarization** | Horizontal | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1595.00 | 38.33 | 54.00 | -15.67 | 42.99 | -4.66 | Average | --- | --- |
| 2 | 1596.00 | 51.61 | 74.00 | -22.39 | 56.27 | -4.66 | Peak | --- | --- |
| 3 | 4880.00 | 36.89 | 54.00 | -17.11 | 31.35 | 5.54 | Average | --- | --- |
| 4 | 4880.00 | 46.57 | 74.00 | -27.43 | 41.03 | 5.54 | Peak | --- | --- |
| 5 | 7320.00 | 44.23 | 54.00 | -9.77 | 32.94 | 11.29 | Average | --- | --- |
| 6 | 7320.00 | 54.66 | 74.00 | -19.34 | 43.37 | 11.29 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

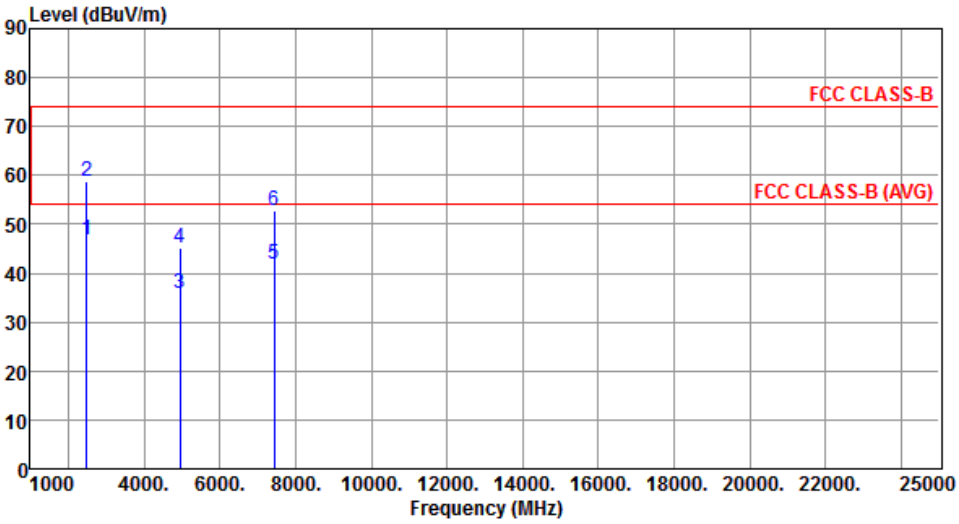
| Modulation | GFSK | Test Freq. (MHz) | 2440 |
|---|---|---|---|
| Polarization | Vertical | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1595.00 | 40.62 | 54.00 | -13.38 | 45.28 | -4.66 | Average | --- | --- |
| 2 | 1595.00 | 53.61 | 74.00 | -20.39 | 58.27 | -4.66 | Peak | --- | --- |
| 3 | 4880.00 | 42.52 | 54.00 | -11.48 | 36.98 | 5.54 | Average | --- | --- |
| 4 | 4880.00 | 49.57 | 74.00 | -24.43 | 44.03 | 5.54 | Peak | --- | --- |
| 5 | 7320.00 | 50.22 | 54.00 | -3.78 | 38.93 | 11.29 | Average | --- | --- |
| 6 | 7320.00 | 59.10 | 74.00 | -14.90 | 47.81 | 11.29 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

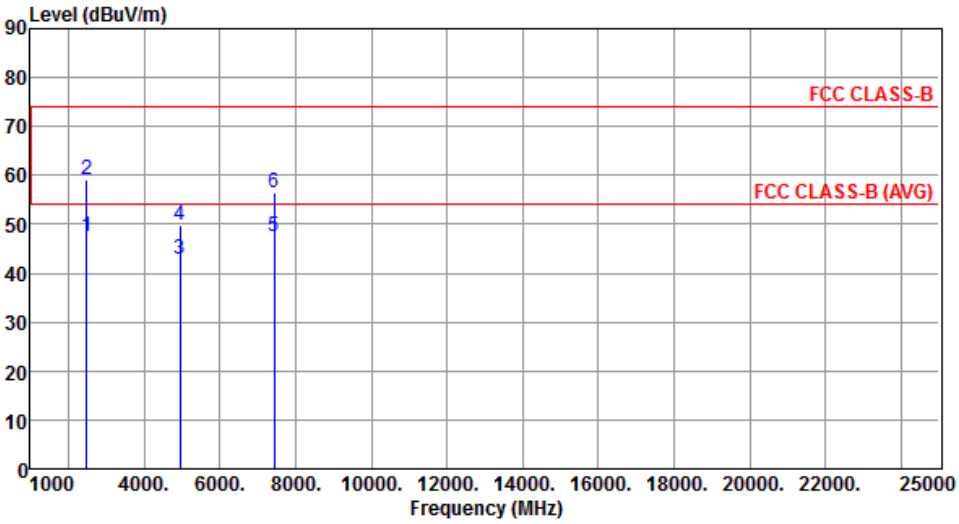
| | | | |
|---|---|---|---|
| **Modulation** | GFSK | **Test Freq. (MHz)** | 2480 |
| **Polarization** | Horizontal | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 46.88 | 54.00 | -7.12 | 48.22 | -1.34 | Average | --- | --- |
| 2 | 2483.50 | 58.70 | 74.00 | -15.30 | 60.04 | -1.34 | Peak | --- | --- |
| 3 | 4960.00 | 35.98 | 54.00 | -18.02 | 30.24 | 5.74 | Average | --- | --- |
| 4 | 4960.00 | 45.11 | 74.00 | -28.89 | 39.37 | 5.74 | Peak | --- | --- |
| 5 | 7440.00 | 41.70 | 54.00 | -12.30 | 30.44 | 11.26 | Average | --- | --- |
| 6 | 7440.00 | 52.64 | 74.00 | -21.36 | 41.38 | 11.26 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

| Modulation | GFSK | Test Freq. (MHz) | 2480 |
|---|---|---|---|
| Polarization | Vertical | | |




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 47.63 | 54.00 | -6.37 | 48.97 | -1.34 | Average | --- | --- |
| 2 | 2483.50 | 59.12 | 74.00 | -14.88 | 60.46 | -1.34 | Peak | --- | --- |
| 3 | 4960.00 | 42.92 | 54.00 | -11.08 | 37.18 | 5.74 | Average | --- | --- |
| 4 | 4960.00 | 49.73 | 74.00 | -24.27 | 43.99 | 5.74 | Peak | --- | --- |
| 5 | 7440.00 | 47.53 | 54.00 | -6.47 | 36.27 | 11.26 | Average | --- | --- |
| 6 | 7440.00 | 56.56 | 74.00 | -17.44 | 45.30 | 11.26 | Peak | --- | --- |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

# 3.6 Emissions in non-restricted Frequency Bands

## 3.6.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

## 3.6.2 Test Procedures

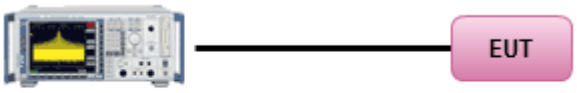
**Reference level measurement**

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

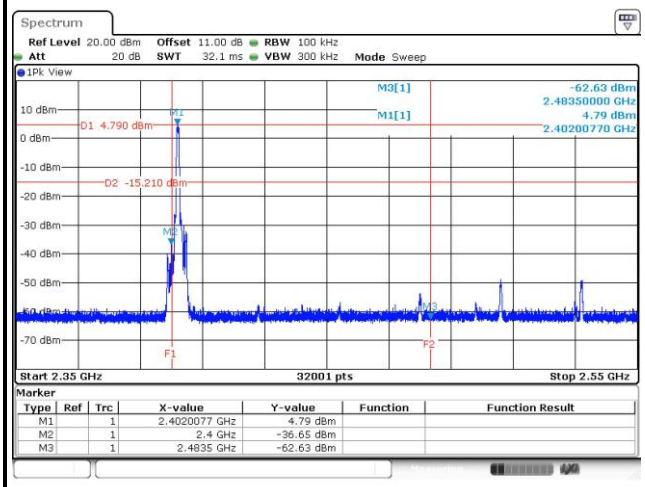
**Emission level measurement**

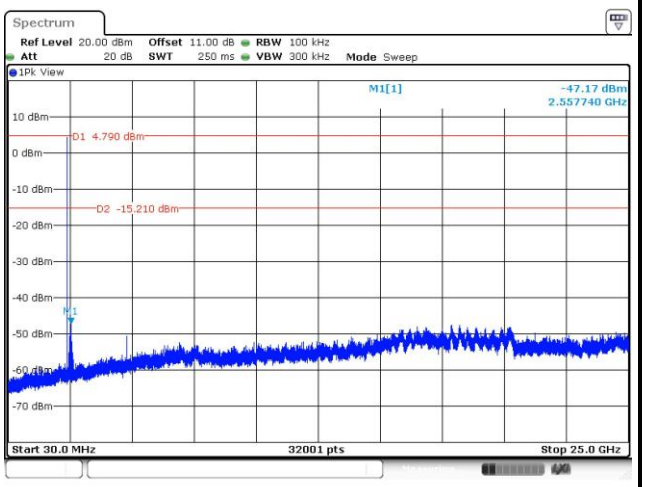
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 26.5GHz
4. Use the peak marker function to determine the maximum amplitude level

## 3.6.3 Test Setup

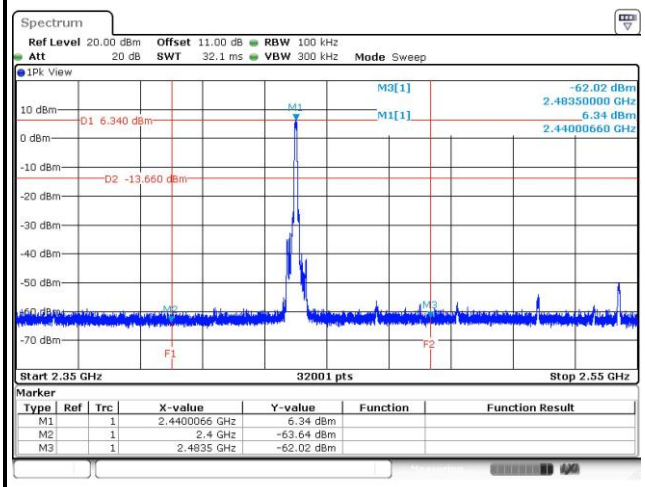
| Transmitter Radiated Bandedge Emissions |
| --- |
|   Spectrum Analyzer |

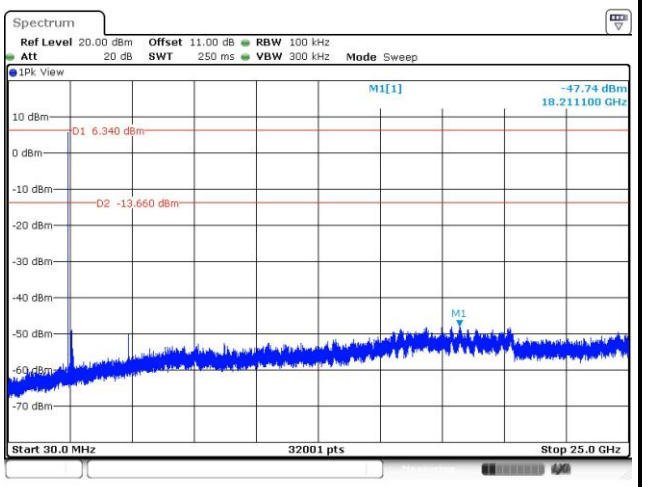
**TX Freq 2402MHz / 30MHz~25GHz (down 20dBc)**



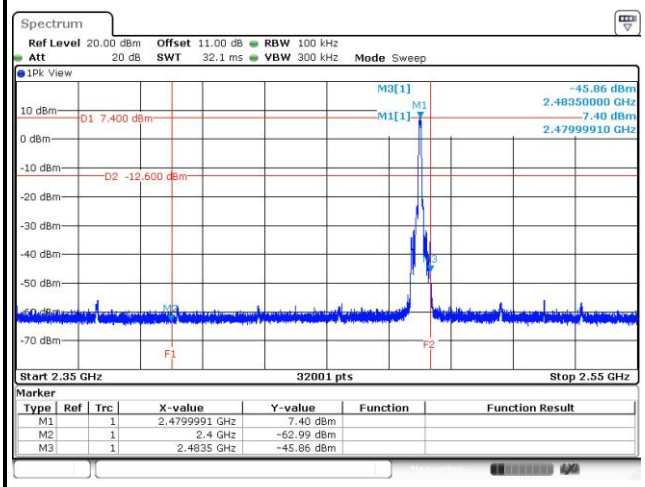



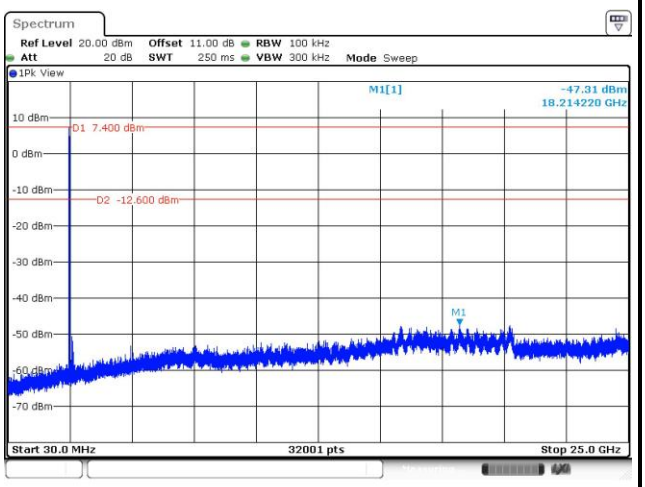

**TX Freq 2440MHz / 30MHz~25GHz (down 20dBc)**




**TX Freq 2480MHz / 30MHz~25GHz (down 20dBc)**



# 4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

| **Linkou** | **Kwei Shan** | **Kwei Shan Site II** |
|---|---|---|
| Tel: 886-2-2601-1640 | Tel: 886-3-271-8666 | Tel: 886-3-271-8640 |
| No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C. | No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C. | No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C. |

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

**==END==**